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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/796,727

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Larry L. Byers

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EXAMINER

THOMAS, SHANE M

ART UNIT

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2186

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/796,727	<b>Applicant(s)</b> BYERS ET AL.	
	<b>Examiner</b> SHANE M. THOMAS	<b>Art Unit</b> 2186	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 January 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-7 and 48-85 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 48-85 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

This Office action is responsive to the amendment filed 1/8/2008. Claims 1-7 and 48-85 are pending. Applicants' arguments and amendments have been carefully considered, but they are not persuasive and do not place the claims in condition for allowance. Accordingly, this action has been made FINAL.

### ***Response to Arguments***

Applicant argues throughout the response on pages 11-13 that “Gary fails to disclose the limitation that the servo controller interface includes first and second interfaces for communicating with first and second processors at different rates.” However, such a limitation is not claimed in amended claims 63, 71, and 79. Instead, Applicant merely claims a first bus operating at a first rate and a second bus operating at a second rate. Such a limitation does not limit the first rate being different from the second rate, merely that the first bus has an associated a first rate and the second bus has an associated rate.

As it is well known in the art that each bus will have a clock rate associated with it, the claim limitation is met by the prior art of Gary et al because it is necessarily inherent that the buses 102 between the processors P0 and P1 and the MUX must operate a respective rate, even if that rate is the same rate, in order to successfully send and receive data. Regardless whether those rates are the same or different, the buses 102 will operate at a respective rate in order to carry the data to and from the processors. The Examiner is calling the rate at which the bus 102 operates with respect to the processor P0 as a “first rate” since the Examiner is considering the

Art Unit: 2186

processor P0 to be a first processor and the rate at which the other bus portion 102 operated with respect to processor P1 as a “second rate” since the Examiner considers the processor P1 to be a second processor.

Applicant additionally argues on page 13 of the response that the Examiner's interpretation of a servo controller interface is improper. Applicant's supplied definition is not specifically claimed in the claims and therefore has not been given weight by the Examiner. The Examiner confirms that the buffer 104 is part of the servo controller interface as it plays a significant role in storing data is sent to and from the host from and to the disk, thereby "interfacing" between the host and disk. Column 3, lines 48-51, of Gary states that the memory 104 is indeed used as a data interface before storing data to the disk. Because figure 1 of Gary shows the buffer memory 104 connected to the disk controller 103 and that data is stored in the buffer memory before being sent to disk 107, it can be seen that the buffer 104 may therefore be considered to be “interfaced” between the servo controller 108 and the processor components, for one, of the disk controller 103.

As such the grounds of rejection for claims 1-7 and 48-85 have been maintained and discussion regarding the newly claimed limitations is set forth below.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3-6, 48-50, 52, 54-57, 59-61, 63, 65-71, 73-79, and 81-85 are rejected under 35 U.S.C. 102(e) as being anticipated by Gary et al. (U.S. Patent No. 6,662,253).

As per claims 1 and 52, Gary teaches an embedded disk controller (figure 1 sans elements 101 and 107) having a servo controller (combination of elements 105 and 108), comprising:

A servo controller interface (combination of all elements within element 103 and element 104 of figure 1 *except* servo controller (elements 105 and 108)) that includes a speed-matching module 104 [3/48-51] and a pipeline control module 205 (shown in figures 2 and 3) such that at least two processors (P0 110 and P1 111), which are being considered to be first and second processors, share memory mapped registers without conflicts [4/65 - 5/13] and [5/29-49]. Gary teaches in section [4/65 - 5/13] that peripheral devices are shared among the processors P1 and P0, wherein each device is memory mapped to a designated address space, and wherein that range of memory mapped addresses includes identification for registers. Therefore, it can be seen that because the processors share the peripheral devices without conflict and each device has its own registers that are memory-mapped, that the processors share the memory mapped registers without conflicts. The pipeline control module 205 serializes access to the devices to one processor at a time as discussed in [5/29-49].

As per claims 3 and 54, it is necessarily inherent that the bus element connecting the servo controller interface (defined supra) to the servo controller (also defined supra) operates at a given frequency. As such, claims 3 and 16 are anticipated since the claim only states that the servo controller and the servo controller interface must operate in the same or different frequency domains. Since the controller and the interface are in operation together (as the disk controller 103 of Gary can be used to access a disk medium 107) it is necessarily inherent that they are operating either in the same frequency domain or different frequency domains.

As per claims 4, 55, 68, 76, Gary teaches [3/45-51] that the speed matching module 104 ensures communication between the host and the disk controller 103 without inserting wait states to the servo controller interface when writing to the servo controller. In other words, because of the difference in frequency domains in which the disk drive and host operate, all incoming write data is buffered in the speed-matching module 104 before being written to the hard drive 107. The write can then be supplied to the disk drive 107 via the servo controller (105+108) from the servo controller interface (defined supra) without the servo controller interface inserting wait states (between write data). Essentially (as known in the art) the speed-matching module allows the servo controller to find the location of the data that is to be written and then supplies the data to the servo interface to be written to the disk drive. This process repeats with the speed-matching module reading the data for next location of data to be written while the servo controller reads the disk drive to that data location. Then once the location has been accessed, the data is supplied from the interface to the controller (105+108); thereby preventing wait states or having the servo controller interface *itself* wait for the data from the host 101 while the controller rotates the disc heads to the proper location on the disk.

As per claims 5 and 56, according to Gary, because of the pipeline control module 205, the processors exclusively share access to the disk drive 107 [6/55-67], and a situation cannot arise where both processors are reading from the disk drive at the same time (i.e. read conflict).

As per claims 6 and 57, the pipeline control module 205 comprises a hardware mechanism for indivisible register access [7/7-15] to the first or second processor. In other words, only one processor may be the owner of the peripheral's I/O register 301 (figure 1), thereby being able to access the peripheral [5/23-27].

As per claims 48,59,69,77, and 84 the pipeline control module 205 resolves conflict (simultaneous access request from both processors for the same resource) between the first and second processor transactions (for access control) [6/48-54] - the protocol logic 204 of the pipeline control module 205 (figure 1) implements the dynamic sharing of the peripherals with the processors.

As per claims 49 and 60, as shown in figure 1, the first and second processor communicate with the servo controller via separate buses (both labeled 102) - [4/2-3].

As per claims 50 and 61, assuming processor P1 is the owner of a given peripheral (in this case the disk drive 107 itself), the pipeline control module 205 will hold write access to the second processor P0 until the first processor releases the peripheral from its ownership - [6/55 - 7/6].

As per claims 63,71, and 79, Gary teaches a first interface (connection between processor 110 and bus 102) for communicating with a first processor 110 over a first bus 102 (figure 1) at a first rate (as it is well known in the art that buses use clock signals, and therefore communicate at a certain rate in any system that uses a bus, thus the Examiner is considering the rate at which the

Art Unit: 2186

bus 102 between the processor P0 and the MUX 205 communicate to be a “first rate”) and a second interface (connection between processor 111 and bus 102) for communicating with a second processor 111 over a second bus 102 (figure 1) at a second rate (the Examiner is considering the rate at which the bus 102 between the processor P1 and the MUX 205 communicate to be a “second rate”). Since bus 102 is separated by a MUX 205, the Examiner is considering each bus connecting a respective processor 110,111 to be a separate bus despite identical numbering. Gary further teaches the servo controller interface (e.g. combination of all elements within element 103 and 104 of figure 1 *except* servo controller (elements 105 and 108)) selectively granting one of the first and second processors access to a servo controller (whichever processor supplies the “owner” signal - [4/37-40] and [5/28-49]).

As per claims 65,73, and 81, Gary teaches the speed matching module 104 resolves conflicts between at least a first (host) and second (disk) clock domains [3/45-51].

As per claims 66,74, and 82, Gary teaches the speed matching module 104 transitions servo controller accesses (via buffering) from one of the first (host) and second clock domains (disk) to the other first and second clock domains [3/45-51]. As known in the art, a buffering element from one frequency domain writes data to a buffer while the element in the second frequency domain reads the data, thereby resolving the differences between the first and second domains.

As per claims 67,75, and 83, it can be seen that the memory mapped registers are within the servo controller (105 and 108) since Gary teaches that each peripheral device attached to the MUX 205 has a peripheral register [4/65 - 5/2] that buffers data going to and coming from those



Art Unit: 2186

peripherals. It can therefore be seen that since the servo controller is attached to the peripheral, the memory mapped registers may be within the servo controller.

As per claims 70,78, and 85, the servo controller interface, by means of the pipeline control module 205, delays a write access for one of the processors 110,111 during write conflicts. Assuming processor P1 is the owner of a given peripheral (in this case the disk drive 107 itself), the pipeline control module 205 will hold write access to the second processor P0 until the first processor releases the peripheral from its ownership - [6/55 - 7/6], thereby overcoming write conflicts.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2,53,64,72, and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gary et al. (U.S. Patent No. 6,662,253).

As per claims 2,53,64,72, and 80, the Examiner is taking Official Notice with regards to one processor operating at a first frequency and a second processor operating at a second frequency as it is well known in the art that processors may operate at unique frequencies. Gary teaches in [3/63-65] that the processors P0 and P1 may be different to optimize particular tasks. Therefore, it would have been obvious to one having ordinary skill in the art to have modified

Art Unit: 2186

the disk controller of Gary in order to have used different processor frequencies to optimize the desired performance for the specific desired tasks.

Claims 7,51,58, and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gary et al. (U.S. Patent No. 6,662,253) in view of Snyder et al. (U.S. Patent No. 6,745,274).

As per claims 7,51,58, and 62, Gary suggests the need for a processor that loses a race condition when vying for a common resource to be made aware that it failed to acquire the resource (to be able to reschedule the write data in one example presented by Gary) but does not specifically teach using a semaphore to control sharing access of the common resource. Snyder teaches a semaphore to synchronize access to a shared resource [1/22-25] and [2/26-38] without requiring special instructions to implement the synchronization control [8/31-36]. Further, Snyder teaches in [4/37-40] that the use of the semaphore allows for processor that did not successfully acquire the shared resource to “learn of the failure” and re-attempt to acquire the semaphore lock - thereby providing a resolution to the suggestion of Gary - [7/11-15].

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have combined the disk controller system of Gary with the teaching of a semaphore of Snyder in order to have implemented a sharing technique that would have allowed a processor (p0, p1) of the system of Gary to have determined that it lost or did not acquire a shared resource when both processors simultaneously request access to the shared peripheral. Once the determination is made, the losing processor may vie for the semaphore lock again to access the peripheral once the other processor releases the lock (figure 2, step 200 of Snyder).

Further regarding claims 51 and 62, Snyder teaches that the hardware mechanism of the disk controller system of modified Gary can be a semaphore register [2/20-21].

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

#### **“Clock Speed”**

([http://web.archive.org/web/20030210202145/http://www.webopedia.com/TERM/C/clock\\_speed.html](http://web.archive.org/web/20030210202145/http://www.webopedia.com/TERM/C/clock_speed.html).) teaches that all buses use a clock rate.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SHANE M. THOMAS whose telephone number is (571) 272-4188. The examiner can normally be reached M-F 8:30 - 5:30.

Art Unit: 2186

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt M. Kim can be reached at (571) 272-4182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Shane M Thomas/  
Primary Examiner, Art Unit 2186

1 April 2008

Shane M. Thomas  
Patent Examiner

/Matt Kim/  
Supervisory Patent Examiner, Art Unit 2186